

Manual Therapy and Pain Science

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Manual therapy and clinicians who label themselves as manual therapists have long held a revered status in the profession of physical therapy. The theories of historical pioneers like Cyriax, Maitland, Kaltenborn, McKenzie and Maitland are still taught as foundational in physical therapy schools across the country. Modern students and experienced clinicians alike are wowed with tales told by modern-day manual therapy gurus of curing 20 years of low back pain with a psoas release, or how correction of dysfunction of the left zygapophyseal joint at the C5-C6 spinal level cured a patient's radicular pain.

The purpose of this article isn't to challenge the veracity of the patient outcomes gained by these past or present manual therapists. Nor is it to discourage use of manual therapy by clinicians, as research has shown it can be highly beneficial for patients with pain of all chronicities. My aim is to provide clinicians with a more modern and evidence-based understanding of what is actually occurring during these manual therapy treatments, so you can be confident that the techniques you are choosing to perform with patients are rooted in a contemporary understanding of pain.

Manual therapy assessment and technique is most often taught purely in the biomedical model of pain. It is explained that nociception from dysfunctional or injured tissues directly leads to pain. And in order to cure pain, it is necessary to identify a biomechanical fault or pathoanatomical driver within the tissues. Then, a corrective manual therapy technique would be applied. This would lead to improved range of motion, and it would be expected that pain and disability would follow. However, as you are likely aware if you have found your way to this article, pain is rarely purely biomechanical.

What is a modern evidence-focused biopsychosocial model clinician to do? On one hand, there is a reticence to reinforce problematic biomechanical explanations for pain which may increase fear-avoidance and pain catastrophization, and to risk decreasing a patient's internal locus of control by increasing dependence on manual therapy techniques. On the other, there is quite a lot of evidence that manual therapy actually has positive benefits to patients.

The solution proposed by Bialosky et al. in *Manual Therapy* in 2009 is that clinicians understand all of the mechanisms by which manual therapy functions in order to fully appreciate, appropriately apply, and accurately explain manual therapy assessments and techniques. So, how does manual therapy REALLY function anyway? According to Louw et al. in their 2020 book *Integrating Manual Therapy and Pain Neuroscience*, there are 8 mechanisms manual therapy operates through.

1. Hypoalgesic Effect.

Hypoalgesia is decreased sensitivity to nociceptive stimuli associated with pain. This is one mechanism you are likely already familiar with that goes by the name of Gate Control Theory.

First proposed by Melzack and Wall, it is explained that a gating mechanism exists in the dorsal horn of the spinal cord. There, stimuli from small nerve fibers sending noxious sensation to the CNS is interrupted by inhibitory interneurons responding to "normal" sensation from large nerve fibers.

This is still one of the main proposed mechanisms for many clinical techniques used today including TENS, pressure, and vibration.

2. Psychosocial Effect

The relationship formed between patient and clinician can be very powerful. Recent studies, such as the one by Fuentes et al. in *Physical Therapy* in 2014, have shown that creating a strong therapeutic alliance and building trust have significant effects in influencing a patient's pain experience.

Also important is the potent placebo effect, which has been shown to influence biological factors such as dopamine production and activation of endogenous opioid pathways.

3. Mechanical Effect

The mechanisms proposed by manual therapy “gurus” don't have to be thrown out entirely!

As Louw puts it, “Irritation of the neuromeningeal structures of the spine is often cited as a cause of pain, i.e., radiculopathy. Although the vast amount of current research in this field pertains to chemical irritation, evidence also points to mechanical issues whereby space around the neuromeningeal structures is compromised, resulting in swelling, increased immune responses, demyelination, exposure of axons, ion channel proliferation, etc. This mechanical stimulation may result in a powerful nociceptive input to the CNS and possible resulting pain experience and in this model, addressing the mechanical source of nociception, i.e., reduction in space, is seen as a possible mechanism to alleviate pain. For example, various studies have shown that lateral glides of the neck result in immediate reduction of neck and/or arm pain, and it is proposed that techniques such as lateral glides and distraction do in fact produce increased “space” which may be one of the mechanisms underpinning the immediate reduction in pain.”

It is possible that other mechanical techniques such as gapping zygoapophyseal joints or distracting the glenohumeral joint may lead to short-term reduction in nociception, allowing for some of the improvements seen following manual therapy.

But it is important to note that these treatment effects are not as specific as often claimed, nor do clinicians really “correct” anatomy with manual therapy techniques. For example a famous study by Chiradejnant and colleagues examined the effects of a therapist-selected low back mobilization technique compared with a randomly-assigned technique. There were no significant difference noted between the two groups, suggesting that manual therapy is helpful, but that “the specific technique used seems unimportant.”

4. Autonomic Effect

Louw notes that studies have shown that following spinal manual therapy techniques, there are immediate short-term changes including “blood flow to extremities, blood pressure, heart rate variability, venous insufficiency, respiratory and cardiovascular function, and more.”

This is relevant because studies such as one by Chen et al. in *Anesthesia and Analgesia* have shown increased blood flow can greatly influence neuropathic pain.

5. Neuromuscular Effect

Several recent studies have shown that manual therapy techniques can influence a person's ability to facilitate improved motor control. For example, Raney et al. found that lumbar thrust manipulation led to changes in contraction of transversus abdominis and internal obliques. Similar effects have been observed in the cervical spine with biceps contraction and shoulder movement.

6. Chemical Effect

One concept that patients are most willing to accept as a contributing factor to their pain is that of inflammation. As an example, the presence of pro-inflammatory molecules IL-1, IL-6, and TNF- α have been shown to contribute significantly to increased pain state. And Teodorczyk-Injeyan and colleagues have shown how spinal manual therapy can significantly down regulate presence of these molecules.

Another chemical effect of manual therapy is that of changing fluid dynamics. In recent years, fluid dynamics has become one of the more well-supported proposed mechanisms for rehabilitation in everything from ankle sprains to knee replacements. And in the lumbar spine, extension exercises and manual techniques biasing the spine into extension have been shown to result in the largest transfer of fluid in and around discs.

7. Neuroplastic Effect

Louw notes that studies have shown significant changes to the brain's primary sensory cortex in those individuals in persistent pain. The result of this in patients with persistent pain is that pain is no longer localized to a specific location of nociception, but is instead spread through a large region. This is the "nonspecific" part of the term "chronic nonspecific low back pain" that predominates in the literature.

Manual therapy has been shown to improve sensory discrimination, which reduces the diffuse nature of many conditions, and may be one of the mechanisms behind "centralization" effects often seen in individuals undergoing physical therapy intervention.

8. Socioeconomic Effect

Multiple studies have shown that time away from work is the single biggest predictor of recovery from a work injury. Therefore, it is imperative to provide the most effective interventions possible to facilitate return to work. A study by Childs et al. performed a six-month follow up of two groups of patients, one received lumbar manipulation and one received exercise only. They found exercise group still had 25% of patients reporting similar levels of missed work as prior to intervention, while the manipulation group found only 9.6% of subjects reported similar levels of missed work.

This is obviously a complex topic, and this article is barely scratching the surface on the topic. But hopefully, it has allowed you to see beyond outdated biomechanical explanations for manual therapy effects and to embrace the myriad of biopsychosocial domains on which the laying of hands on patients operates.

If you have any further thoughts on this or any other topics related to the treatment of individuals in pain, we encourage you to engage with the rest of the APTA Michigan Pain SIG on our facebook page.

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